## SEQUENCE LISTING

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<110> MCFADDEN, GRANT
ESSANI, KARIM
<120> NUCLEIC ACID MO
FOR IMMUNE MODULATION
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<120> NUCLEIC ACID MOLECULES AND POLYPEPTIDES FOR IMMUNE MODULATION

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<130> 50082/015002
<150> US 60/239,354
<151> 2000-10-11
<160> 9
<170> FastSEQ for Windows Version 4.0
<210> 1
<211> 26
<212> PRT
<213> Tanapox virus
<400> 1
Ile Thr Leu Lys Tyr Cys Tyr Thr Val Thr
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The Thr Leu Lys Tyr Cys Tyr Thr Val Thr Leu Lys Asp Asn Gly Leu 1 5 10 15

Tyr Asp Lys Val Phe Tyr Cys His Tyr Asn 20 25

<210> 2 <211> 338 <212> PRT <213> Yaba Monkey tumor virus

<400> 2 Met Asn Lys Leu Ile Leu Phe Ser Thr Ile Val Ala Val Cys Asn Cys 10 5 Ile Thr Leu Lys Tyr Asn Tyr Thr Val Thr Leu Lys Asp Asn Gly Leu 25 20 Tyr Asp Gly Val Phe Tyr Asp His Tyr Asn Asp Gln Leu Val Thr Lys 40 Ile Ser Tyr Asn His Glu Thr Arg His Gly Asn Val Asn Phe Arg Ala 60 55 Asp Trp Phe Lys Ile Ser Arg Ser Pro His Thr Pro Gly Asn Asp Tyr 75 70 65 Asn Phe Asn Phe Trp Tyr Ser Leu Met Lys Glu Thr Leu Glu Glu Ile 90 85 Asn Lys Asn Asp Ser Thr Lys Thr Thr Ser Leu Ser Leu Ile Thr Gly

100 105 110

Cys Tyr Glu Thr Gly Leu Leu Phe Gly Ser Tyr Gly Tyr Val Glu Thr
115 120 125

Ala Asn Gly Pro Leu Ala Arg Tyr His Thr Gly Asp Lys Arg Phe Thr
130 135

Lys Met Thr His Lys Gly Phe Pro Lys Val Gly Met Leu Thr Val Lys

Lys Met Thr His Lys Gly Phe Pro Lys Val Gly Met Led The Val Lys 145 150 155 160 Asn Thr Leu Trp Lys Asp Val Lys Thr Tyr Leu Gly Gly Phe Glu Tyr

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175
                                    170
                165
Met Gly Cys Ser Leu Ala Ile Leu Asp Tyr Gln Lys Met Ala Lys Gly
                                185
            180
Glu Ile Pro Lys Asp Thr Thr Pro Thr Val Lys Val Thr Gly Asn Glu
                                                 205
                            200
        195
Leu Glu Asp Gly Asn Met Thr Leu Glu Cys Ser Val Asn Ser Phe Tyr
                                             220
                        215
Pro Pro Asp Val Ile Thr Lys Trp Ile Glu Ser Glu His Phe Lys Gly
                                         235
                    230
Glu Tyr Lys Tyr Val Asn Gly Arg Tyr Tyr Pro Glu Trp Gly Arg Lys
                                     250
                245
Ser Asp Tyr Glu Pro Gly Glu Pro Gly Phe Pro Trp Asn Ile Lys Lys
                                                     270
                                 265
Asp Lys Asp Ala Asn Thr Tyr Ser Leu Thr Asp Leu Val Arg Thr Thr
                                                 285
                            280
        275
Ser Lys Met Ser Ser Gln Leu Val Cys Val Val Phe His Asp Thr Leu
                                             300
                         295
Glu Ala Gln Val Tyr Thr Cys Ser Glu Gly Cys Asn Gly Glu Leu Tyr
                    310
Asp His Leu Tyr Arg Lys Thr Glu Glu Gly Glu Gly Glu Asp Glu
                                     330
                325
Glu Asp
<210> 3
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<210> 3 <211> 1183 <212> DNA <213> Yaba Monkey tumor virus

<400> 3 atgaataagt taattttatc gttgttgggt tttgtggcaa cttgcaattg tataacctta 60 agatataatt ataccgttac ggtaaagaat ggattatacg acggggtatt ttttgattat 120 tacaacgatc agttagtaac gaggatatca tataaccatg aaactagaca cggaaacgta 180 aattctagag cttcatggtt tgatatctct aaaagccctc atactccggg tgacgattac 240 cactttaact tttggtaccc gttaatgaaa gatactttgg agtccatcaa tagtaataaa 300 aacgaaagcg ataaatgttc ttcgttgtcg ttaattttgg ggtgttatga aacgggatct 360 ctttttggga gttacggata cgttgagtca agtggcggac cgttggctag gtatagcacg 420 aaagataaaa agtttttaaa aatgacagat aaaggatttc caaaggttgg aatgttaacc 480 gttcatggtc ctagttggca aacagttaaa aaatacgtgg gagggtttgt gtacgctgga 540 tgtttgctag ctatttttga ttatcaaaaa atggctaaga ataacatacc tagtaatgta 600 atgccaactg ttacggtaac gggtgaggaa ctgcaagatg gtaacacaac gcttaagtgt 660 aacgtaaaat ctttttaccc tccagacgta atgatcaagt ggatagaaag taaatatttt 720 aacggtgaat atagatacgt taatggaaga gaatacccgg aatggggaag gcaatcagat 780 tatgagcccg gagagccagg ttttccgtta catccaaaaa aagatgacgg taaaaccact 840 tacagccttt tagattttgg tcgcactacg tcaggattaa ctagtcagtt agtttgtgtt 900 gttttccatg acacgtttga atcgcaggtt aatacatgtt ccgaagggtg tgaaggtaaa 960 ttatacgatc acctatatag aaaatcggaa gaaggagacg aggttgtgga ggacgaagaa 1020 gactgaaaac aagtcgtggt ggaagctgtt ctgatcgcgc gtttacgttt ccgctagacg 1080 gaagtttgcc gcccgagagg gcgatgtttt ttttaaaaaa tgaaaaagta gatgataccg 1140 1183 agcgatgacc gcgaaatgga ggttattaca gacggcgtgt tcg

<210> 4 <211> 338 <212> PRT <213> Tanapox virus

 $<\!400\!>\,4$  Met Asn Lys Leu Ile Leu Phe Ser Thr Ile Val Ala Val Cys Asn Cys

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Ile Thr Leu Lys Tyr Asn Tyr Thr Val Thr Leu Lys Asp Asn Gly Leu
                               25
           20
Tyr Asp Gly Val Phe Tyr Asp His Tyr Asn Asp Gln Leu Val Thr Lys
                            40
        35
Ile Ser Tyr Asn His Glu Thr Arg His Gly Asn Val Asn Phe Arg Ala
                        55
Asp Trp Phe Lys Ile Ser Arg Ser Pro His Thr Pro Gly Asn Asp Tyr
                                       75
                   70
Asn Phe Asn Phe Trp Tyr Ser Leu Met Lys Glu Thr Leu Glu Glu Ile
               85
                                    90
Asn Lys Asn Asp Ser Thr Lys Thr Thr Ser Leu Ser Leu Ile Thr Gly
                                                    110
                                105
           100
Cys Tyr Glu Thr Gly Leu Leu Phe Gly Ser Tyr Gly Tyr Val Glu Thr
                                                125
                           120
        115
Ala Asn Gly Pro Leu Ala Arg Tyr His Thr Gly Asp Lys Arg Phe Thr
                       135
Lys Met Thr His Lys Gly Phe Pro Lys Val Gly Met Leu Thr Val Lys
                                        155
                   150
Asn Thr Leu Trp Lys Asp Val Lys Thr Tyr Leu Gly Gly Phe Glu Tyr
                                    170
                                                        175
               165
Met Gly Cys Ser Leu Ala Ile Leu Asp Tyr Gln Lys Met Ala Lys Gly
                                185
                                                    190
            180
Glu Ile Pro Lys Asp Thr Thr Pro Thr Val Lys Val Thr Gly Asn Glu
                                                205
                            200
Leu Glu Asp Gly Asn Met Thr Leu Glu Cys Ser Val Asn Ser Phe Tyr
                                            220
                        215
Pro Pro Asp Val Ile Thr Lys Trp Ile Glu Ser Glu His Phe Lys Gly
                                        235
                    230
Glu Tyr Lys Tyr Val Asn Gly Arg Tyr Tyr Pro Glu Trp Gly Arg Lys
                                                        255
                                    250
                245
Ser Asp Tyr Glu Pro Gly Glu Pro Gly Phe Pro Trp Asn Ile Lys Lys
                                                    270
                                265
Asp Lys Asp Ala Asn Thr Tyr Ser Leu Thr Asp Leu Val Arg Thr Thr
                                                285
                            280
Ser Lys Met Ser Ser Gln Leu Val Cys Val Val Phe His Asp Thr Leu
                                            300
                        295
Glu Ala Gln Val Tyr Thr Cys Ser Glu Gly Cys Asn Gly Glu Leu Tyr
                                        315
                    310
Asp His Leu Tyr Arg Lys Thr Glu Glu Gly Glu Glu Glu Asp Glu
                                    330
                325
Glu Asp
```

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<210> 5
<211> 1034
<212> DNA
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<213> Tanapox virus

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<400> 5
aagcttcatg aataagttaa tattatttag cacaattgta gcagtttgta actgcataac 60
tttaaaatat aattatactg ttacgttaaa agataatggg ttatacgatg gagtattta 120
cgatcattac aacgatcagt tagtaacgaa aatatcatat aaccacgaaa ctagacacgg 180
aaacgtaaat tttagggctg attggttaa tattctagg agtccccaca cgccaggtaa 240
cgattacaac tttaactttt ggtattcttt aatgaaagaa actttagaag aaattaataa 300
aaacgatagc acaaaaacta cttcgctttc attaatcact gggtgttatg aaacaggatt 360
attatttggt agttatggt atgtagaaac ggccaacgga ccgttggcca gataccatac 420
aggagataaa aggtttacga aaatgacaca taaaggtttt cccaaggttg gaatgttaac 480
```

```
tgtaaaaaac actctttgga aagatgtaaa aacttatcta ggcggttttg aatacatggg 540
atgttcatta gctattttag attaccaaaa aatggctaaa ggtgaaatac caaaagatac 600
aacacctaca gtgaaagtaa cgggtaatga gttagaagat ggtaacatga ctcttgaatg 660
cagtgtaaat tcattttacc ctcctgacgt aattactaag tggatagaaa gcgaacattt 720
taaaggtgaa tataaatatg ttaacggaag atactatcca gaatggggga gaaaatccga 780
ttatgagcca ggagagccag gttttccatg gaatattaaa aaagataaag atgcaaacac 840
atatagttta acagatttag tacgtacaac atcaaaaatg agtagtcaac tagtatgtgt 900
tgttttccat gacactttag aagcgcaagt ttatacttgt tctgaaggat gcaatggaga 960
gctatacgac cacctatata gaaaaacaga agaaggagaa ggtgaagagg atgaagaaga 1020
cggaaaccct cgag
<210> 6
<211> 338
<212> PRT
<213> Yaba-like disease virus
<400> 6
Met Asp Lys Leu Leu Phe Ser Thr Ile Val Ala Val Cys Asn Cys
                                    10
Ile Thr Leu Lys Tyr Asn Tyr Thr Val Thr Leu Lys Asp Asp Gly Leu
                                25
            20
Tyr Asp Gly Val Phe Tyr Asp His Tyr Asn Asp Gln Leu Val Thr Lys
                            40
Ile Ser Tyr Asn His Glu Thr Arg His Gly Asn Val Asn Phe Arg Ala
                        55
Asp Trp Phe Asn Ile Ser Arg Ser Pro His Thr Pro Gly Asn Asp Tyr
                                         75
                    70
Asn Phe Asn Phe Trp Tyr Ser Leu Met Lys Glu Thr Leu Glu Glu Ile
                                    90
                85
Asn Lys Asn Asp Ser Thr Lys Thr Thr Ser Leu Ser Leu Ile Thr Gly
                                                     110
                                105
            100
Cys Tyr Glu Thr Gly Leu Leu Phe Gly Ser Tyr Gly Tyr Val Glu Thr
                                                 125
                            120
Ala Asn Gly Pro Leu Ala Arg Tyr His Thr Gly Asp Lys Arg Phe Thr
                                             140
                        135
Lys Met Thr His Lys Gly Phe Pro Lys Val Gly Met Leu Thr Val Lys
                                        155
                    150
Asn Thr Leu Trp Lys Asp Val Lys Ala Tyr Leu Gly Gly Phe Glu Tyr
                                     170
                165
Met Gly Cys Ser Leu Ala Ile Leu Asp Tyr Gln Lys Met Ala Lys Gly
                                 185
            180
Lys Ile Pro Lys Asp Thr Thr Pro Thr Val Lys Val Thr Gly Asn Glu
                                                 205
                             200
        195
Leu Glu Asp Gly Asn Met Thr Leu Glu Cys Thr Val Asn Ser Phe Tyr
                                             220
                         215
Pro Pro Asp Val Ile Thr Lys Trp Ile Glu Ser Glu His Phe Lys Gly
                                         235
                     230
Glu Tyr Lys Tyr Val Asn Gly Arg Tyr Tyr Pro Glu Trp Gly Arg Lys
                                                         255
                                     250
                245
Ser Asn Tyr Glu Pro Gly Glu Pro Gly Phe Pro Trp Asn Ile Lys Lys
                                 265
            260
Asp Lys Asp Ala Asn Thr Tyr Ser Leu Thr Asp Leu Val Arg Thr Thr
                             280
                                                 285
        275
Ser Lys Met Ser Ser Gln Pro Val Cys Val Val Phe His Asp Thr Leu
                                             300
                         295
Glu Ala Gln Val Tyr Thr Cys Ser Glu Gly Cys Asn Gly Glu Leu Tyr
                                         315
                    310
Asp His Leu Tyr Arg Lys Thr Glu Glu Gly Glu Gly Glu Asp Glu
                                     330
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325

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<210> 7
<211> 1017
<212> DNA
<213> Yaba-like disease virus
<400> 7
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tataattata ctgttacgtt aaaagatgat gggttatacg atggagtatt ttacgatcat 120
tacaacgatc agttagtgac gaaaatatca tataaccatg aaactagaca cggaaacgta 180
aattttaggg ctgattggtt taatatttct aggagtcccc acacgccagg taacgattat 240
aactttaact tttggtattc tttaatgaaa gaaactttag aagaaattaa taaaaacgat 300
agcacaaaaa ctacttcgct ttcattaatc actgggtgtt atgaaacagg attattattt 360
ggtagttatg ggtatgtaga aacggccaac gggccgttgg ccagatacca tacaggagat 420
aaaaggttta cgaaaatgac acataaaggt tttcccaagg ttggaatgtt aactgtaaaa 480
aacactcttt ggaaagatgt aaaagcttat ttaggcggtt ttgaatatat gggatgttca 540
ttagctattt tagattacca aaaaatggct aaaggtaaaa taccaaaaga tacaacacct 600
acagtgaaag taacgggtaa tgagttagaa gatggtaaca tgactcttga atgcactgta 660
aattcatttt accctcctga cgtaattact aagtggatag aaagcgaaca ttttaaaggt 720
gaatataaat atgttaacgg aagatactat ccagaatggg ggagaaaatc caattatgag 780
ccaggagagc caggttttcc atggaatatc aaaaaagata aagatgcaaa tacatatagt 840
ttaacagatt tagtacgtac aacatcaaaa atgagtagtc aaccagtatg tgttgttttc 900
catgacactt tagaagcgca agtttatact tgttctgaag gatgcaatgg agagctatac 960
gatcacctat atagaaaaac agaagaaggg gaaggtgaag aggatgaaga agactga
<210> 8
<211> 340
<212> PRT
<213> Swinepox virus (C1L)
<400> 8
Met Ile Thr Lys Ala Ile Val Ile Leu Ser Ile Ile Thr Ala Tyr Val
                 5
                                     10
Asp Ala Ser Ala Phe Leu Val Tyr Asn Tyr Thr Tyr Thr Leu Gln Asp
                                 25
            20
Asp Asn His Arg Tyr Asp Phe Glu Val Thr Asp Tyr Phe Asn Asp Ile
                                                 45
                             40
Leu Ile Lys Arg Leu Lys Leu Asn Ser Glu Thr Gly Arg Pro Glu Leu
                                             60
                         55
Arg Asn Glu Pro Pro Thr Trp Phe Asn Glu Thr Lys Ile Arg Tyr Tyr
                                         75
                                                             80
                    70
Pro Lys Asn Asn Tyr Asn Phe Met Phe Trp Leu Asn Arg Met Ser Glu
                                     90
                 85
Thr Leu Asp Glu Ile Asn Lys Leu Pro Glu Thr Ser Asn Pro Tyr Lys
                                                     110
                                 105
Thr Met Ser Leu Thr Ile Gly Cys Thr Asp Leu Arg Gln Leu Gln Val
                                                 125
                             120
Asn Phe Gly Tyr Val Thr Val Gly Gly Asn Ile Trp Thr Arg Phe Asp
                                             140
                         135
Pro Lys Asn Lys Arg Phe Ser Lys Val Arg Ser Arg Thr Phe Pro Lys
                                         155
                     150
Val Gly Met Leu Thr Val Lys Ser Gln His Trp Glu Arg Val Met Glu
                                     170
                 165
His Leu Gly Ser Met Val Thr Leu Thr Cys Pro Phe Thr Ala Asp Asp
                                 185
Tyr Tyr Lys Ile Ser Lys Gly Tyr Ile Asp Lys Pro Val Lys Pro Thr
```

```
195
                            200
                                                 205
Val Thr Val Thr Gly Ile Glu Arg Gly Asp Asn Thr Thr Leu Ile Cys
                        215
                                            220
Thr Phe Asp Asn His Tyr Pro Ser Ser Val Ala Val Lys Trp Tyr Asn
                    230
                                        235
Ile Glu Asp Phe Ala Pro Asp Tyr Arg Tyr Asp Pro Tyr Val Asn Glu
                                    250
                245
Leu Leu Pro Asp Thr Asp Tyr Leu Pro Gly Glu Pro Gly Tyr Pro Thr
            260
                                265
                                                     270
Ile Thr Arg Arg Leu Gly Asp Lys Tyr Leu Phe Thr Ser Ser Pro Arg
                            280
                                                285
Val Met Val Pro Thr Ile Met Ser Asn Arg Ile Ala Cys Val Gly Phe
                        295
                                            300
His Ser Thr Leu Glu Pro Ser Ile Tyr Arg Cys Val Asn Cys Ser Gly
                                        315
                    310
Pro Glu Pro Val Leu Gln Tyr Gln Gly Asp Arg Asn Asp Leu Glu
                325
                                    330
Asp Glu Glu Asp
            340
<210> 9
<211> 1023
<212> DNA
<213> Swinepox virus (C1L)
<400> 9
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atgattacta aagcgattgt gatattgtct attattacag catatgtaga tgcttccgca 60 ttcttagtat acaattatac atatacttta caagatgata atcatcgata tgacttcgaa 120 gtcaccgatt attttaatga tatactaata aaacgtttaa aactaaatag cgagacagga 180 agaccagaat taagaaatga accaccaaca tggtttaatg agactaagat tagatattat 240 ccgaaaaata attataattt tatgttctgg ctaaatagaa tgagtgaaac gctagatgag 300 ataaataaac ttccagaaac gagtaatcct tacaagacta tgtccttgac aattggatgt 360 actgatctaa gacaacttca agtaaatttc ggttatgtta ctgtaggtgg taatatatgg 420 acacgattcg accccaagaa taaacgcttt agtaaagtta gatcacgtac atttccaaag 480 gtaggaatgt taactgttaa atcacaacac tgggaacgtg ttatggaaca tcttggatca 540 atggtaacat taacatgtcc gtttacagcg gatgattatt ataaaatttc taagggatat 600 atagataagc cagttaagcc tactgttaca gttacaggaa ttgaaagagg agataatact 660 acattgatat gcacatttga taatcattat ccgtcgtcgg tcgctgttaa atggtataac 720 atcgaggact ttgctccgga ctatcgttat gatccgtacg taaatgaatt gcttcctgat 780 acggactatc taccgggtga accaggatat ccgactataa ctaggagatt aggtgataaa 840 tatttattta catcatcacc tagggttatg gtaccaacta tcatgtctaa tagaatagca 900 tgtgttggat ttcatagtac gttagaacca agcatatata gatgtgtaaa ctgctcggga 960 cctgagcctg ttttacaata ccagggagat agaaggaatg acttggagga tgaggaggat 1020 taa 1023